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Children's concealment of a minor transgression: The role of age, maltreatment, and executive functioning



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ABSTRACT

This study examined the role of age, maltreatment status, and executive functioning on 752 4- to 9-year-old maltreated and non-maltreated children's recall disclosure of a transgression in which the children appeared to have broken toys while playing with a stranger. Interviewers used narrative practice rapport building and then questioned children with free recall and cued recall questions. Younger and maltreated children were more likely to disclose during rapport building, whereas older and nonmaltreated children were more likely to disclose in response to recall questions. Working memory deficits appeared to mediate the relation between children's characteristics and disclosure during rapport but not during recall. The results demonstrate that how children are questioned affects the relations between deception and age, maltreatment, and executive functioning.

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Introduction

Ekman (1985) distinguished between two types of lies: concealment and falsification. When liars *conceal* information, they withhold information without "saying anything untrue" (p. 28). In contrast, when liars *falsify*, they take an additional step and make a false statement. Concealment is of theoret-

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ical interest because of its differences with falsification. Concealment is arguably easier than falsification (Ekman, 1985; Vrij, 2008). Concealment might not seem as reprehensible as falsification; indeed, some do not consider concealing to be lying (Coleman & Kay, 1981). Concealment may also be easier to subsequently excuse than falsification because one can claim that the target detail was overlooked rather than deliberately omitted (Ekman, 1985; Vrij, 2008).

Concealment has largely been neglected in developmental work on deception. Reviews of experimental work, analyzing the relations among deception, age, and executive functioning, have focused on falsification (Talwar & Crossman, 2012; Talwar & Lee, 2008a, 2008b). Similarly, in the observational work on the development of deception, Newton, Reddy, and Bull (2000) acknowledged but did not analyze concealment, emphasizing that their work was on “explicit falsification,” and Wilson, Smith, and Ross (2003) similarly limited their study to “false statements.” This is somewhat surprising, because researchers have speculated that concealment emerges earlier than falsification (Frank, 1992), and thus its origins are of developmental interest.

One reason why concealment may have been overlooked is because developmental work often conflates concealment with false denials, which involve falsification. For example, psychologists and philosophers have sometimes called concealment “lies of omission” (Ekman, 1985; Paley, 1785/2002), but in the developmental literature “omission” has been applied to children’s false denials of transgressions (Nysse-Carris, Bottoms, & Salerno, 2011; Tate, Warren, & Hess, 1992). Similarly, philosophers have equated concealment with “secrecy” (Bok, 1983), but research on children’s secrecy includes both concealment and false denials (Gordon, Lyon, & Lee, 2014). Indeed, the term “concealment” itself has been applied to false denials (“active concealment”; Lavoie, Nagar, & Talwar, 2017).

The distinction between concealment and falsification is also of practical significance. In the law, perjury requires falsification. As a result, dishonest witnesses attempt to conceal information through evasive responses, and their examiners attempt to exhaust their reports, forcing them to choose between admission and falsification (Tiersma & Solan, 2012).

Concealment is an important issue for applied developmental psychology, in part because of concerns about children’s disclosure of maltreatment. On the one hand, it is well accepted that most victims of child sexual abuse fail to disclose their abuse during childhood (London, Bruck, Wright, & Ceci, 2008; Lyon & Ahern, 2011). On the other hand, interviewers are warned that directly asking children whether they have suffered from abuse increases both false allegations (Lamb, Brown, Hershkowitz, Orbach, & Esplin, 2018) and false denials (Lyon, McWilliams, & Williams, 2019). Therefore, interviewers are encouraged to increase children’s verbosity early in the interview through narrative practice rapport building and to elicit elaborate reports through extensive use of recall questions (Lamb et al., 2018). The extent to which one can overcome concealment without increasing the risk of falsification is thus an issue for applied researchers.

In this study, we report the results of a mega-analysis of a series of studies conducted in a single lab in which 752 4- to 9-year-old maltreated and nonmaltreated children had been admonished to conceal a transgression by a stranger and were then questioned about their interaction by an interviewer who built rapport and then asked recall questions. Rapport building provided an opportunity for children to disclose the transgression without any external impetus, whereas recall provided an opportunity for children to disclose the transgression in response to questions about their interaction that did not directly reference the transgression. Conversely, children who wished to conceal the transgression could do so without falsification. We combined participant-level data to maximize statistical power (Olkin, 1995), and in addition to analyzing age and maltreatment effects, examined the relation between disclosure and previously unreported executive functioning (EF) measures, testing whether the effects of age and maltreatment were mediated by working memory and performance on the Day–Night Stroop task (Baron & Kenny, 1986). In what follows, we review the research on the relations between concealment and age, maltreatment, and EF.

Increased concealment during the preschool years

With respect to falsification, both observational work (Newton et al., 2000; Wilson et al., 2003) and experimental work (Evans & Lee, 2013; Leduc, Williams, Gomez-Garibello, & Talwar, 2017; Polak &

Harris, 1999; Talwar & Lee, 2002a, 2008a, 2008b; Talwar, Lee, Bala, & Lindsay, 2002; Williams, Leduc, Crossman, & Talwar, 2017) have found increases in deception from 2 to 5 years of age. The observational work notes that children's early falsification typically involves denials of wrongdoing, and most of the experimental work has used the temptation resistance paradigm (TRP), in which children are admonished not to peek at a toy and are subsequently asked whether they peeked.

Relatively little work has examined the development of concealment. Wilson and Pipe (1989) and Pipe and Wilson (1994) examined 5- and 6-year-olds' tendency to disclose that a magician had spilled ink on some gloves after being urged to keep it a secret; most children failed to disclose the accident in response to recall questions about the magician's behavior. Because younger children were not tested, however, the research could not test for early age differences in recall disclosure. Furthermore, interviewers neither asked rapport recall questions nor followed up children's recall with requests for elaboration, rendering the studies a weak test of children's tendency to conceal.

More recently, a series of studies examined concealment among 4- to 9-year-old maltreated and nonmaltreated children (Ahern, Stolzenberg, McWilliams, & Lyon, 2016; Lyon et al., 2014; McWilliams, Stolzenberg, Williams, & Lyon, in press; Quas, Stolzenberg, & Lyon, 2018; Stolzenberg, McWilliams, & Lyon, 2017). The child interacted with a stranger who engaged the child in play with a series of toys, two of which appeared to break in the child's hands. The stranger admonished secrecy because disclosure could "get [them] in trouble." An interviewer then questioned the child, first building rapport by asking recall questions about child's interests, and then questioned the child about his or her interaction with the stranger, again asking recall questions, including follow-up questions requesting elaboration until the child reported that he or she had disclosed everything. The process mimicked recommended practice for forensic interviewers questioning children about suspected maltreatment, who are trained to elicit reports of abuse without asking recognition questions that may elicit false alarms or force reluctant children to utter false denials (American Professional Society on the Abuse of Children, 2012). Furthermore, because they were encouraged to play with the toys by the stranger and believed that they had broken the toys, children were motivated to conceal the transgression to avoid implicating themselves and the stranger.

Across studies, most children failed to disclose the transgression during the rapport building or in response to recall questions about their interactions with the stranger (Ahern et al., 2016; Lyon et al., 2014; McWilliams et al., in press; Quas et al., 2018; Stolzenberg et al., 2017). Similar results have been observed in studies using slightly different procedures or examining different subpopulations (Lyon, Malloy, Quas, & Talwar, 2008 [maltreated children only]; Rush, Stolzenberg, Quas, & Lyon, 2017 [middle- and upper-middle-class children]).

The rapport building phase provides an opportunity for children to spontaneously disclose the transgression without any impetus from the interviewer. Rapport disclosure is somewhat analogous to "accidental disclosures" of child abuse that have been noted in the literature to predominate among younger children, where disclosure appears to be inadvertent rather than calculated (Campis, Hebdencurtis, & Demaso, 1993; Mian, Wehrspann, Klajner-Diamond, Lebaron, & Winder, 1986). In the broken toy studies, a small percentage of 4- to 9-year-olds spontaneously disclosed the transgression during rapport building (Ahern et al., 2016; Lyon et al., 2014; McWilliams et al., in press; Quas et al., 2018; Rush et al., 2017; Stolzenberg et al., 2017). Two studies found that rapport disclosers were predominantly younger children (Ahern et al., 2016; Stolzenberg et al., 2017), although three studies failed to find any significant age differences (Lyon et al., 2014; Quas et al., 2018; Rush et al., 2017). Because the number of early disclosers was small, a mega-analysis of these data would facilitate a sensitive test for age differences in rapport disclosure.

Although they involve prosocial concealment, two studies finding age increases in concealment are of some relevance. Peskin and Ardino (2003) examined 3- to 5-year-olds' ability to conceal the existence of a surprise birthday cake. A confederate repeatedly expressed hunger, wondering (but not directly asking) whether "there is anything to eat." Most 3-year-olds pointed to or mentioned the cake, whereas most older children stayed mum. Lavoie and Talwar (2018) examined 4- to 11-year-olds' ability to conceal a surprise gift they had made with the experimenter for their parent. The parent initially asked "How was it?" and then "What did you do?" followed by "What was the surprise?" Children who fully disclosed were younger than children who concealed the identity of the surprise,

who in turn were younger than children who falsified information about their behavior. The studies on prosocial concealment, thus, suggest age increases in concealment among younger children.

The role of EF in early concealment

Executive functioning, which encompasses a group of higher-level mental abilities including planning, goal-directed behaviors, attention, memory, and organization (Reitan & Wolfson, 1994), is frequently highlighted by researchers as a potential mechanism underlying preschool children's lie-telling development. EF has been shown to develop rapidly during the preschool years (Carlson, 2005; Zelazo, Carlson, & Kesek, 2008).

To lie in response to the TRP, the child must inhibit a truthful response, keeping in mind the admonition not to peek, and utter a falsehood; thus, it is sensible that EF would be implicated. Research using the TRP has found a positive relation between false denials and children's EF performance, particularly when EF is measured by the Stroop task, in which children are taught to provide discrepant labels such as labeling a picture of the sun as "night" and a picture of the moon as "day" (Evans & Lee, 2013; Talwar & Lee, 2008a, 2008b; Talwar, Gordon, & Lee, 2007; Williams et al., 2017).

To conceal information, the child must inhibit truthful information while keeping in mind the admonition not to disclose. In a number of the broken toy studies, the researchers administered EF measures, including the Stroop task and working memory, but did not report the relation between disclosure and EF (Ahern et al., 2016; McWilliams et al., in press; Quas et al., 2018; Stolzenberg et al., 2017). These data can also be included in a mega-analysis to assess the relation between EF and disclosure.

Again, two studies examining children's prosocial concealment are notable. Peskin and Ardino (2003) failed to find a relation between EF (the Stroop task) and concealment in 3- to 5-year-olds. Lavoie and Talwar (2018) also failed to find a relation between EF (the Stroop task and working memory) and concealment in 4- to 11-year-olds. Thus, these studies question whether age increases in concealment are related to EF.

Decreased concealment in grade school

Some research has found that falsification begins to show declines before adolescence (Evans & Lee, 2011; Lavoie, Yachison, Crossman, & Talwar, 2017), and in a review of the research Talwar and Crossman (2011) suggested that "children's lie-telling might increase to a peak in elementary school ... and then decrease thereafter" (pp. 168–169).

With respect to concealment, Pipe and Wilson (1994) found that 10-year-olds were less likely than 6-year-olds to conceal the magician's mishap. Heyman, Loke, and Lee (2016) found that 8- to 11-year-olds were less likely than 4- to 7-year-olds to conceal the fact that an adult had ripped a page out of a library book (when asked "what happened?"). In both studies, however, children were not themselves implicated in the transgression. Most of the broken toy paradigm studies found no significant differences across 4- to 9-year-olds in disclosure rates (Ahern et al., 2016; Lyon et al., 2014; Quas et al., 2018; Rush et al., 2017; Stolzenberg et al., 2017), although one study found that the oldest children (8- and 9-year-olds) were less likely to conceal breakage (McWilliams et al., in press).

If concealment does in fact decrease among grade school children, it seems unlikely that this will be related to EF simply because older children exhibit better EF performance than younger children. Indeed, Evans and Lee (2011) found that EF failed to predict lying among 8- to 16-year-olds. Hence, any decrease in concealment in age raises questions about other developmental processes that might influence concealment.

Concealment by maltreated children and its relation to EF

Although there is a great deal of discussion in the literature regarding maltreated children's tendency to conceal their maltreatment (e.g., Alaggia, Collin-Vézina, & Lateef, 2019), surprisingly little experimental research has examined maltreated children's tendency to conceal. Maltreated children

often exhibit deficits in EF (DePrince, Weinzierl, & Combs, 2009), which is understandable in terms of the lack of consistency, predictability, and stability in their environment. Immature EF could lead maltreated children to be less adept at concealment and more likely to accidentally disclose information. One broken toy study found that maltreated children were more likely than nonmaltreated children to disclose during rapport building (Lyon et al., 2014). However, as noted above, because rapport disclosure is quite rare, prior research has had limited power to uncover differences, and most studies using the broken toy paradigm have found no differences in maltreated and nonmaltreated children's tendency to disclose during the rapport-building phase of the interview (Ahern et al., 2016; Quas et al., 2018; Stolzenberg et al., 2017).

Although maltreated children may exhibit deficits in EF and, thus, have greater difficulty in concealment, their experiences may increase their motivation to conceal transgressions. Maltreated children have been shown to expect adults to behave in unsupportive, rejecting, or punitive ways (Shields, Ryan, & Cicchetti, 2001; Shipman & Zeman, 2001; Toth, Cicchetti, Macfie, Rogosch, & Maughan, 2000), and this could increase their fears of reprisals for disclosing transgressions. Therefore, although maltreated children might be more likely to accidentally disclose, they may be less likely to disclose in response to recall questions about their interactions. Similar to the findings with respect to rapport building, studies using the broken toy paradigm have not consistently found maltreatment differences in disclosure during the recall phase of the interview (Ahern et al., 2016; Lyon et al., 2014; Quas et al., 2018; Stolzenberg et al., 2017); however, Ahern et al. (2016) noted that "maltreated children exhibited some nonsignificant tendencies toward less disclosure" (p. 799). Combining across samples would provide a more sensitive test of possible differences.

The current study

In the current study, we examined the relation between concealment of a minor transgression and age, maltreatment, and EF in 752 4- to 9-year-old children. The child first completed two EF tasks: the Day-Night Stroop task and the Backward Digit Span subtest of the Wechsler Intelligence Scale for Children (WISC; Wechsler, 2003). The child then engaged in play with a stranger, during which two toys appeared to break in the child's hands. The stranger asked the child to keep the breakage a secret, noting that they "might get in trouble" if anyone found out about the toys breaking. After the stranger left the room, a separate interviewer entered and questioned the child following a structured interview. She began with recall questions eliciting a narrative about the child's likes, dislikes, and recent birthday, comprising the rapport-building phase of the interview, and then asked free and cued recall questions about the play session, comprising the recall phase of the interview. We examined disclosure of the transgression during rapport building and, excluding children who already disclosed during rapport building, disclosure during recall.

We made several predictions. First, with respect to disclosure during rapport building, we predicted higher rates of disclosure among *younger* children (Ahern et al., 2016; Stolzenberg et al., 2017) and among *maltreated* children (Lyon et al., 2014). Although these results have appeared only sporadically in prior research, we suspected that they would be reliable with the large sample studied here. Second, with respect to disclosure to recall questions, we predicted higher rates of disclosure among *older* children (Bussey, Lee, & Grimbeek, 1993; McWilliams et al., in press; Pipe & Wilson, 1994). Given hints in prior research (Ahern et al., 2016), we also tentatively predicted higher rates of recall disclosure among *nonmaltreated* children. Third, we predicted that younger children and maltreated children would perform less well on the EF tasks, based on prior research showing age improvement in EF (e.g., Carlson, 2005) and deficits among maltreated children (DePrince et al., 2009). Fourth, based on the proposition that younger and maltreated children's tendency to disclose during rapport building could be attributable to immature EF, we predicted that EF would mediate the relation between age and rapport disclosure and between maltreatment and disclosure during rapport building. Fifth, based on the proposition that older and nonmaltreated children's tendency to disclose during recall did not reflect deficits in EF, we predicted that EF would *not* mediate the relation between children's characteristics and disclosure during recall.

Method

Participants

Data from the current study were compiled from a series of experimental studies in a single lab recruiting both maltreated and nonmaltreated children and using the broken toy paradigm (Ahern et al., 2016; McWilliams et al., in press; Quas et al., 2018; Stolzenberg et al., 2017). All children who had experienced toy breakage and completed EF measures were included. Although EF measures were taken in each of the studies, none of those results has been previously reported. The sample included 752 4- to 9-year-old maltreated ($n = 378$) and nonmaltreated ($n = 374$) children ($M_{\text{age}} = 6.5$ years, $SD = 1.6$ years; 50% girls). The sample was 67% Latino, 23% African American, 5% Caucasian, 4% biracial, and 1% unknown/other. The maltreated subsample (125 4- and 5-year-olds, 128 6- and 7-year-olds, and 125 8- and 9-year-olds) was 64% Latino, 23% African American, 8% Caucasian, 4% biracial, and 1% unknown/other. The nonmaltreated sample (116 4- and 5-year-olds, 129 6- and 7-year-olds, and 129 8- and 9-year-olds) was 70% Latino, 24% African American, 1% Caucasian, 3% biracial, and 2% unknown/other.

The maltreated sample consisted of children substantiated as suffering from neglect and/or physical or sexual abuse who had been removed from the custody of their parents or guardians. Children gave their assent, and consent was obtained from the Presiding Judge of Juvenile Court. Maltreated children were not eligible if they were awaiting a hearing at which they might testify or if they were not English speaking. Children in the nonmaltreated sample were recruited from schools serving predominantly ethnic minority families in neighborhoods comparable to those from which most maltreated children were removed.

Materials and procedure

After obtaining assent from children, the interviewer first administered the EF tasks.

Day–Night Stroop task

The Day–Night Stroop task consisted of 6 practice pictures (3 of a moon and 3 of a sun) and 16 test pictures (8 of a moon and 8 of a sun) (Gerstadt, Hong, & Diamond, 1994). During the practice phase, children were trained to say “day” when shown a picture of a moon and to say “night” when shown a picture of a sun. Following successful completion of the practice trials, children were then shown a series of 16 test pictures in a randomized order. Children received 1 point for each correct response to a picture, for a maximum score of 16.

Digit span

The Backward Digit Span subtest from the WISC was administered. In this standardized measure, children are asked to repeat a series of numbers in backward order. The number of digits increases with each successful trial. When children achieve ceiling on each task/order (i.e., two consecutive errors in a trial), the task ends. The highest series of digits achieved by each child was recorded. Children received 1 point for every series of digits correctly repeated.

Interaction with the stranger

Following administration of the EF measures, the interviewer told the child that she forgot some papers and needed to retrieve them from her office. A stranger entered the room shortly thereafter and expressed interest in playing with toys on shelves facing the child. There were eight boxes of toys on two sets of shelves. Each box contained two of the same type of toy. The stranger played with six of the eight types of toys. The stranger retrieved a box, removed a toy, described it, and demonstrated how to play with it. She then removed the other toy and gave it to the child so that he or she could play. The stranger then placed the toys back in the box and returned the box to the shelf. Two of the toys appeared to break when the child played with them. For each broken toy, the stranger described what occurred (e.g., “When you put the monkey down and turned it on, it broke”), expressed

concern (“This is not good”), and made an attempt to conceal the breakage (e.g., “We better put the monkey back so nobody knows it’s broken”). On leaving the room, the stranger admonished the child not to disclose breakage because they “might get in trouble if [the interviewer] finds out.”

Narrative practice rapport building

The interviewer returned and first engaged the child in structured rapport building for 3 to 5 min modeled after the National Institute of Child Health and Human Development (NICHD) structured protocol for interviewing children (Sternberg et al., 1997). The interviewer asked the child about things he or she liked to do and did not like to do and then asked the child to describe everything that happened on his or her birthday and the day before the interview. The interviewer followed up the child’s responses with cued recall questions (e.g., “You said you brushed your teeth. What happened next?”).

Recall

The interviewer then inquired about the play session using recall questions. The interviewer first asked the child to tell her “everything that happened” when the stranger came in and followed up with “what happened next” questions until the child mentioned the stranger leaving. If the child merely mentioned play with “toys,” the interviewer asked the child to describe everything that he or she played with. The interviewer followed up any mention of play with a specific toy or breakage with a request for additional information (e.g., “You said you played with the lobster. Tell me everything that happened when you played with the lobster”).

Debriefing

The stranger reentered the room, and the interviewer explained the purpose of the study to the child, including that she knew that the stranger would come in and play with the child. The interviewer emphasized the importance of always telling the truth about what happened and reassured the child that no one was in trouble for the broken toys. In addition, the stranger took responsibility for the toy breakage and explained that the broken toys could be fixed. After the stranger left the room, the interviewer asked the child about her thoughts and feelings during the toy play interaction, during the subsequent interview, and about participating in the study.

Coding

All sessions were videotaped and transcribed. Children’s responses during rapport and during recall were coded as disclosures if they revealed toy breakage. Children’s statements were coded as disclosures if they revealed toy breakage.

Results

Preliminary analyses

Preliminary analyses revealed that child gender, child ethnicity, stranger identity, and interviewer identity were unrelated to children’s responses and that interview instruction manipulations (e.g., talking about good and bad secrets [Ahern et al., 2016], eliciting a promise to tell the truth [McWilliams et al., in press; Quas et al., 2018], administering the putative confession [Stolzenberg et al., 2017]) did not interact with the EF measures in predicting disclosure. We first examined children’s disclosures in relation to their age and maltreatment status. Second, we examined the relation between age and maltreatment status and EF measures (Day–Night Stroop and Backward Digit Span). Third, we examined the relation between the EF measures and disclosure, controlling for age and maltreatment status. These steps follow the recommended pattern of analyses for assessing mediation (Baron & Kenny, 1986) because our ultimate aim was to determine whether EF mediated the relation between disclosure and age or maltreatment.

Rapport disclosure as a function of age and maltreatment

First, we conducted binary logistic regressions to test the relation between age and disclosure and between maltreatment and disclosure during rapport building. Six percent of children ($n = 43$) disclosed breakage during rapport. We entered children's rapport disclosures as the predicted variable (0 = no disclosure, 1 = disclosure). Age group (4 to 5, 6 to 7, or 8 to 9 years old) and maltreatment status (0 = nonmaltreated, 1 = maltreated) were entered into the model. The model was significant, $\chi^2(3, 752) = 34.60, p < .001$. Age was a significant predictor, Wald = 23.92, $p < .001$ (Table 1). Specifically, 4- and 5-year-olds were more likely to disclose during rapport (13%, $n = 30$) than 6- and 7-year olds (2%, $n = 4$), $B = -2.20$, Wald = 16.45, $p < .001$, odds ratio (OR) = 9.09, 95% confidence interval (CI) = 3.13, 25.00, and were more likely to disclose than 8- and 9-year-olds (4%, $n = 9$), $B = -1.35$, Wald = 11.73, $p < .001$, OR = 3.84, 95% CI = 1.79, 8.33. When 8- and 9-year-olds were the reference category, disclosure rates were not significantly different from the 6- and 7-year-old group, $B = -0.85$, Wald = 1.95, $p = .16$. Maltreatment status was also significant, $B = 0.75$, Wald = 4.89, $p = .03$, OR = 2.12, 95% CI = 1.09, 4.13 (Table 2). Maltreated children were more likely to disclose during rapport (8%, $n = 29$) than nonmaltreated children (4%, $n = 14$).

Recall disclosure as a function of age and maltreatment

Removing children who disclosed during rapport, 32% ($n = 227$) of all children disclosed breakage in response to recall questions, whereas 68% concealed the transgression. For recall, we entered children's disclosures as the predicted variable (0 = no disclosure, 1 = disclosure), and age group and maltreatment status were entered into the model. The model was significant, $\chi^2(709) = 12.60, p = .01$. Age was significant, Wald = 6.14, $p = .05$. The 8- and 9-year-olds were more likely to disclose in response to recall questions (38%, $n = 92$) than the 6- and 7-year-olds (27%, $n = 69$), $B = -0.48$, Wald = 6.02, $p = .01$, OR = 1.61, 95% CI = 1.10, 2.38. However, the oldest children's disclosure rate was no different from the youngest children (31% [$n = 66$] of 4- and 5-year-olds disclosed during recall). Maltreatment status was significant, $B = -0.41$, Wald = 6.45, $p = .01$, OR = 0.66, 95% CI = 0.48, 0.91. Maltreated children were less likely to disclose during recall (25%, $n = 96$) than nonmaltreated children (35%, $n = 131$).

EF as a function of age and maltreatment

We next conducted a series of linear regressions to test the relation between age and maltreatment status and EF measures (Day-Night Stroop and Backward Digit Span). We first performed a linear

Table 1
Percentages of disclosure [and *ns*] and executive functioning means (and standard deviations) by age group.

	4- and 5-year-olds [$n = 241$]	6- and 7-year-olds [$n = 257$]	8- and 9-year-olds [$n = 254$]	Total [$N = 752$]
Rapport disclosure	13% [30]	2% [4]	4% [9]	6% [43]
Recall disclosure	31% [66/211]	27% [69/253]	38% [92/245]	32% [227/709]
Day-Night Stroop	11.60 (4.81)	13.25 (3.63)	14.59 (2.56)	13.18 (3.95)
Backward Digit Span	1.67 (2.05)	3.84 (1.95)	5.37 (1.75)	3.67 (2.44)

Table 2
Percentages of disclosure [and *ns*] and executive functioning means (and standard deviations) by maltreatment status.

	Maltreated [$n = 378$]	Nonmaltreated [$n = 374$]
Rapport disclosure	8% [29]	4% [14]
Recall disclosure	25% [96]	35% [131]
Day-Night Stroop	12.69 (4.22)	13.67 (3.59)
Backward Digit Span	3.35 (2.46)	3.98 (2.38)

regression with Day–Night Stroop scores as the predicted variable. Age and maltreatment were entered into the model. The model was significant, $F(2, 749) = 45.73, p < .001$. Age was significantly related to children's performance on the Day–Night Stroop, $B = 1.49, p < .001$. Children in the 4- and 5-year-old group scored significantly lower on the Day–Night Stroop ($M = 11.60, SD = 4.81$) compared with children in the 6- and 7-year-old group ($M = 13.25, SD = 3.63$), $t(751) = -4.35, p < .001, d = 0.39$, and children in the 8- and 9-year-old group ($M = 14.59, SD = 2.56$), $t(751) = -8.71, p < .001, d = 0.78$. Children in the 6- and 7-year-old group also scored significantly lower ($M = 13.25, SD = 3.63$) than children in the 8- and 9-year-old group ($M = 14.59, SD = 2.56$), $t(751) = 4.82, p < .001, d = 0.43$. Maltreated children scored significantly lower on the Day–Night Stroop ($M = 12.69, SD = 4.22$) than nonmaltreated children ($M = 13.67, SD = 3.59$), $t(750) = 3.45, p < .001, d = 0.24$.

We next performed a linear regression with the Backward Digit Span scores as the predicted variable. Age and maltreatment were once again entered into the model. The regression model was significant, $F(2, 749) = 241.58, p < .001$. Children's Backward Digit Span scores significantly increased with age, $F(2, 749) = 232.00, p < .001$. Children in the 4- and 5-year-old group scored significantly lower on Backward Digit Span ($M = 1.67, SD = 2.05$) compared with children in the 6- and 7-year-old group ($M = 3.84, SD = 1.95$), $t(751) = -12.10, p < .001, d = -1.08$, and children in the 8- and 9-year-old group ($M = 5.37, SD = 1.75$), $t(751) = -21.64, p < .001, d = 1.94$. Children in the 6- and 7-year-old group also scored significantly lower than children in the 8- and 9-year-old group, $t(751) = -9.36, p < .001, d = 0.83$. Maltreated children ($M = 3.35, SD = 2.46$) had significantly lower scores than nonmaltreated children ($M = 3.98, SD = 2.38$), $t(750) = 3.56, p < .001, d = 0.26$.

Rapport disclosure as a function of EF, age, and maltreatment

Finally, we examined whether the relation between disclosure and both age and maltreatment was mediated by EF. Prior to mediation, we examined the correlations between the variables entered into our mediation analysis (Table 3). With respect to disclosure during rapport, we used the 4- and 5-year-olds as the comparison group because the age analyses found that these children were more likely to disclose during rapport than older children. First, we examined the relation between EF measures and rapport disclosures, controlling for age. We performed a binary logistic regression, with children's rapport disclosures entered as the predicted variable. Age groups (with 4- and 5-year-olds as the comparison group), Backward Digit Span scores, and Day–Night Stroop scores were entered as factors. The model was significant, $\chi^2(4, 752) = 39.00, p < .001$. Age (with 4- and 5-year-olds as the comparison group) was a significant predictor, $Wald = 8.78, p = .01$. Children in the 6- and 7-year-old group were significantly less likely to disclose than those in the 4- and 5-year-old group, $Wald = 8.70, p = .003$, $OR = 0.19, 95\% CI = 0.06, 0.57$. Backward Digit Span was significantly predictive of disclosure, $\beta = -.02, Wald = 5.95, p = .02, OR = 0.80, 95\% CI = 0.66, 0.96$, such that children with higher scores were less likely to disclose. In contrast, Day–Night Stroop scores were not predictive of disclosures, $\beta = -.04, Wald = 1.13, p = .29, OR = 0.96, 95\% CI = 0.90, 1.00$. To test for whether the observed effect of age was partially mediated by Backward Digit Span, we used a bootstrap estimation approach (Hayes, 2012, 2018; Preacher & Hayes, 2004, 2008). The bootstrap confidence intervals derived from 5000 samples indicated that the indirect effect coefficient was significant, $\beta = -.55, SE = .22, 95\% CI = -1.03, -0.18$.

Table 3

Correlations for rapport building disclosure, age group, maltreatment status, Day–Night Stroop, and Backward Digit Span ($N = 752$).

	1	2	3	4	5
1. Rapport disclosure					
2. Age group	-.154**				
3. Maltreatment status	.085**	-.021			
4. Day–Night Stroop	-.123**	.308*	-.125**		
5. Backward Digit Span	-.185**	.615**	-.129**	.420**	

* $p < .05$.

** $p < .01$.

Hence, there was evidence that working memory partially mediated the negative relation between age and rapport disclosure.

In a second binary logistic regression we examined the relationship between EF measures and rapport disclosures, controlling for maltreatment status. Children's rapport disclosures were entered as the predicted variable. Children's maltreatment status, Backward Digit Span scores, and Day-Night Stroop scores were entered as factors. The model was significant, $\chi^2(3, 757) = 29.57, p < .001$. Maltreatment status was not significant, $\beta = .60, Wald = 2.70, p = .10, OR = 1.70, 95\% CI = 0.89, 3.40$. Backward Digit Span was significantly predictive of disclosure, $\beta = -.30, Wald = 15.35, p < .001, OR = 0.74, 95\% CI = 0.64, 0.86$. In contrast, Day-Night Stroop scores were not significantly predictive, $\beta = -.04, Wald = 1.00, p = .32, OR = 0.96, 95\% CI = 0.90, 1.00$. The bootstrapping confidence intervals derived from 5000 samples indicated that the indirect coefficient was significant, $\beta = .20, SE = .08, 95\% CI = 0.07, 0.38$. Because maltreatment status was no longer significant once the EF measures were entered into the analysis, and the mediation analysis was significant, there was evidence that working memory fully mediated the positive relation between maltreatment and rapport disclosure.

Recall disclosure as a function of EF, age, and maltreatment

With respect to disclosure during recall, we used the 8- and 9-year-olds as the comparison group because this age group was most likely to disclose during recall. Again prior to mediation, we examined the correlations entered into our mediation analysis (Table 4). We performed a binomial logistic regression with recall disclosure as the predictive variable. Age groups (with 8- and 9-year-olds as the comparison group), Backward Digit Span scores, and Day-Night Stroop scores were entered as factors. The model was significant, $\chi^2(4, 705) = 11.85, p = .02$. Age groups (with 8- and 9-year-olds as the comparison group) was not significant, $Wald = 4.44, p = .11$. Backward Digit Span was significant, $\beta = .10, Wald = 4.51, p = .03, OR = 1.10, 95\% CI = 1.00, 1.20$. Notably, children with higher scores were more likely to disclose. In contrast, Day-Night Stroop was not predictive of recall disclosures, $\beta = -.04, Wald = 2.93, p = .09, OR = 0.96, 95\% CI = 0.91, 1.00$. Bootstrap estimation (derived from 5000 samples) indicated that the indirect coefficient was not significant, $\beta = .16, SE = .09, 95\% CI = -.02, 0.35$. Therefore, Backward Digit Span did not mediate the positive relationship between age and recall disclosure.

Next, we performed a binomial logistic regression with recall disclosure as the predicted variable. Maltreatment status, Backward Digit Span scores, and Day-Night Stroop scores were entered as factors. The model was significant, $\chi^2(3, 706) = 13.22, p = .004$. Maltreatment status significantly predicted disclosure, $\beta = -.40, Wald = 6.03, p = .01, OR = 0.67, 95\% CI = 0.48, 0.92$, with maltreated children being less likely to disclose. Backward Digit Span was significant, $\beta = .09, Wald = 6.00, p = .01$. However, Day-Night Stroop again did not predict disclosure, $\beta = -.04, Wald = 3.41, p = .07, OR = 0.96, 95\% CI = 0.91, 1.00$. Bootstrap estimation (derived from 5000 samples) indicated that the indirect coefficient was not significant, $\beta = -.03, SE = .23, 95\% CI = -.09, 0.001$. Backward Digit Span did not mediate the negative relation between maltreatment and recall disclosure.

Discussion

This study conducted a mega-analysis of 752 maltreated and nonmaltreated 4- to 9-year-olds and examined the relationship between children's concealment of an adult's transgression and age, mal-

Table 4

Correlations for recall disclosure, age group, maltreatment status, Day-Night Stroop, and Backward Digit Span ($N = 709$).

	1	2	3	4	5
1. Recall disclosure					
2. Age group	.057				
3. Maltreatment status	-.095*	.004			
4. Day-Night Stroop	-.024	.285*	-.107**		
5. Backward Digit Span	.080*	.595**	-.105**	.405**	

* $p < .05$.

** $p < .01$.

treatment status, and EF. A number of our predictions were supported. Regarding disclosure during rapport building, 4- and 5-year-olds were several times more likely than older children to disclose, and maltreated children were twice as likely as nonmaltreated children to disclose. With respect to disclosures during recall, the oldest children exhibited the highest rates of disclosure, and maltreated children were 30% less likely to disclose than nonmaltreated children. Children also exhibited the predicted patterns with respect to EF performance, with younger and maltreated children scoring lower on measures of EF than nonmaltreated and older children.

We then tested our predictions that EF would mediate the relations between age and rapport disclosure and between maltreatment and rapport disclosure. Our prediction was partially supported. With respect to disclosure during rapport, children who performed more poorly on the Backward Digit Span task were more likely to disclose, and their performance on the task partially mediated the relation between age and disclosure and between maltreatment and disclosure. In contrast, children's performance on the Day-Night Stroop task was not related to rapport disclosure. With respect to recall disclosure, children's performance on the Backward Digit Span task was *positively* related to disclosure and did not mediate the relation between age and disclosure and between maltreatment and disclosure. The Day-Night Stroop task was not related to recall disclosure. In what follows, we review our findings in light of prior research and discuss limitations of this study and future directions for research.

Age differences

Younger children were more likely than older children to disclose before any questions about their interaction with the stranger. This is consistent with prior research on concealment, albeit about positive information, in which younger children were more likely to spontaneously disclose information they had been encouraged to keep secret (Lavoie & Talwar, 2018; Peskin & Ardino, 2003). Nevertheless, disclosure during rapport building was quite rare, such that 87% of even the youngest children (4- and 5-year-olds) failed to disclose the transgression during rapport.

Older children were more likely than younger children to disclose during the recall portion of the interview, during which they were asked about their interactions with the stranger but were not directly asked whether a transgression occurred. This is also consistent with prior research on concealment, which has identified an increase in recall disclosure among older children (Heyman et al., 2016; Pipe & Wilson, 1994). Nevertheless, even among the oldest children (8- and 9-year-olds), 62% of children kept the transgression a secret during recall questions.

As discussed below, there is good evidence that cognitive immaturity helps to explain younger children's difficulty in concealment. This is also the case for maltreated children's greater tendency to disclose during rapport building. However, the mechanisms underlying age differences and maltreatment differences during recall disclosure are unclear. In research examining children's attitudes about disclosure of transgressions, there is evidence that younger children focus more on the negative effects of disclosure (punishment) and older children focus more on the negative effects of concealment and falsification (guilt). Smith and Rizzo (2017) presented 4- and 5-year-olds and 7- to 9-year-olds scenarios in which the protagonist children concealed wrongdoing from their mothers (by omitting information when answering a recall question) and asked participants how the protagonists felt and why. They found that the older children attributed more negative feelings to the protagonists than the younger children and were more likely to explain those feelings as guilt due to nondisclosure. Examining falsification, Bussey (1992, 1999) showed that 4- and 5-year-olds, but not 7- and 8-year-olds, rated lies as more negative when they were punished. It was not until 7 or 8 years of age that children ascribed more positive feelings to children who told the truth about a transgression than to children who lied.

With respect to maltreatment effects, maltreated children may both anticipate and fear punishment more than nonmaltreated children. As noted in the Introduction, they anticipate more negative and punitive reactions from adults (Shields et al., 2001; Shipman & Zeman, 2001; Toth et al., 2000). Furthermore, a punitive home environment may lead to weaker internalization of moral standards (Kochanska & Aksan, 2006).

As yet, however, there is little evidence of a relation between children's attitudes about concealment and their behavior. Lake, Lane, and Harris (1995) found that 5- to 7-year-olds who believed that

a child concealing a transgression would feel guilt were more likely to refrain from cheating in a guessing game. However, the authors did not appear to control for age. Future work should assess the relation among age, moral development, and concealment behavior.

The role of EF in concealment and falsification

Although we found that children's working memory, as measured by Backward Digit Span, helped to explain younger children's and maltreated children's greater tendency to disclose during rapport building, the Stroop task failed to predict either rapport or recall disclosure. In contrast, a number of studies have found that children who admitted transgressing when asked a recognition question about the transgression perform less well on EF tasks, most often a Stroop task in which children must provide discrepant labels for objects or words (Evans & Lee, 2013; Talwar & Lee, 2008b; Talwar et al., 2007; Williams et al., 2017). The Stroop task is understood as a test of both inhibition and working memory because the participant must inhibit a prepotent response (e.g., calling the moon "night") while keeping in mind the rule (e.g., calling the moon "day").

Answering recognition questions (e.g., "Did you peek at the toy?") deceptively is quite like the Stroop task in that children must inhibit a prepotent response (answering the question correctly) while keeping in mind that they ought not to have peeked and, therefore, ought to deny doing so. Moreover, for the youngest children, the prepotent response to yes/no questions is more likely to be "yes" because young preschoolers (2-year-olds and young 3-year-olds) exhibit a "yes" bias (Fritzley & Lee, 2003; Fritzley, Lindsay, & Lee, 2013) and children with limited EF skills are particularly likely to show such a bias (Moriguchi, Okanda, & Itakura, 2008). Hence, falsification is likely particularly difficult for the youngest children if they must give a "no" response. Notably, even 3-year-olds lied 85% of the time when asked whether a confederate with an unsightly rouge spot on his nose looked "okay" for his picture (Talwar & Lee, 2002b); lying only required a "yes" response.

Concealment may tap different aspects of EF than falsification. Children must keep in mind the admonition against disclosing the transgression, and this may task their working memory. Because children are not directly asked about the transgression and do not need to produce a false response, concealment might not draw so heavily on children's inhibitory abilities. This provides a possible explanation for our finding that performance on the Backward Digit Span task, which taps working memory, was correlated with rapport disclosure but that the Stroop task, which taps inhibition and working memory, was not. However, this explanation is admittedly post hoc given that we failed to predict this finding.

Neither Backward Digit Span nor the Stroop task predicted disclosure in response to recall questions. In part, this was probably attributable to the inclusion of a rapport-building phase of the interview. Had we begun questioning with recall questions, it is likely that the children with the poorest inhibition skills would have disclosed. Asking rapport questions is a means by which the most uninhibited children are captured. Furthermore, the greater disclosure among older children, who obviously have more mature EF skills, worked against a negative relation between disclosure and EF. Clearly, more work needs to be done in understanding the role of EF in the early development of concealment.

Practical implications

The broken toy paradigm was developed to simulate pressures on children to conceal abuse. The interaction with the stranger was initially positive and engaging and then led to a transgression in which the child felt jointly implicated. Perpetrators of sexual abuse often seduce children through initially positive interactions and then admonish secrecy (Leclerc, Proulx, & Beauregard, 2009). Victims of sexual and physical abuse commonly refer to their fears of being blamed and their positive feelings for the perpetrator as barriers to disclosure (Anderson, Martin, Mullen, Romans, & Herbison, 1993; Hershkowitz, Lanes, & Lamb, 2007). In turn, the interview was designed to mimic the qualities of a good forensic interview; the interviewer first spent time building rapport through recall questions and then asked recall questions to encourage the child to reveal any transgressions that may have

occurred (Lamb et al., 2018). Inclusion of both maltreated and nonmaltreated children enabled us to assess how children's prior histories may influence their willingness to disclose.

The greater prevalence of spontaneous disclosures among younger children and maltreated children, particularly those with poorer working memory, is consistent with the finding that younger children often disclose abuse accidentally, that is, without any questioning directed at investigating abuse (Campis et al., 1993; Mian et al., 1986). Moreover, studies examining children's disclosures of sexual abuse in forensic interviews often find that substantial percentages of children disclose before the interviewer begins the allegation phase (Lyon, Scurich, Choi, Handmaker, & Blank, 2012; Sternberg, Lamb, Orbach, Esplin, & Mitchell, 2001).

However, disclosure during rapport building was nevertheless quite low even among the youngest children (13%), which is particularly notable given that the transgression had only just occurred (and in the same location in which the interview took place), making it most likely that children had the transgression in mind. In actual abuse interviews, the abuse and prior discussions about abuse are likely to be more remote. Hence, as a practical matter, it is probably unrealistic to assume that rapport building is likely to elicit substantial numbers of children to disclose maltreatment. To elicit disclosures from young children, it may be most productive to identify questions that bring transgressions to mind while avoiding directly suggesting transgressions. For example, in a broken toy study in which children were questioned 1 week after the transgression occurred, about 20% of children who had kept the transgression a secret during initial questioning disclosed when asked recall questions about their conversations with the stranger (Stolzenberg, McWilliams, & Lyon, 2018).

Of course, disclosing abuse is different from disclosing toy breakage. Abuse is far more serious, and so are the pressures on children to conceal or to disclose. Furthermore, one of the major impediments to disclosure of abuse is that it is typically committed by adults close to the child. Gordon et al. (2014) examined 4- to 12-year-olds' concealment after a parent had broken a toy in the child's presence and asked the child to promise not to tell. They found that older children were less likely to disclose; indeed, 97% of the 10- to 12-year-olds failed to disclose breakage when asked recall questions about their interaction with the parent. Unless children have already disclosed abuse, eliciting disclosures remains a daunting task (Hershkowitz, Lamb, & Katz, 2014).

In sum, this study identified important differences in children's concealment of a transgression based on children's age, maltreatment status, and working memory. The results highlight the importance of considering concealment as well as falsification and the potential for accidental disclosures as well as deliberate disclosures. Furthermore, the age increases in recall disclosure and the limited findings with respect to the role of EF in deception highlight the need to identify additional mechanisms underlying children's deception development. Understanding what influences children's disclosures improves our understanding of cognitive and social development and can help practitioners to identify optimal questioning strategies for interviewing children about their experiences.

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